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# HANDLING LIVESTOCK DURING DROUGHT

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During and following a period of severe drought, livestock may be made, through proper management, to serve as a valuable asset both to their owners and the entire country. Domestic animals represent a reserve food supply carried over from times of plenty. Intelligently handled they can be saved for another crop year. This circular contains suggestions for obtaining these results.

Experience has shown that communities which have become depleted of foundation breeding stock during times of emergency have required many years to replace the loss. Close cooperation among stockmen, local, State, and Federal extension forces, and business men and bankers will inspire confidence, make possible timely movements of feed and stock, and prevent unwarranted sacrifice of breeding reserves.

County agricultural extension agents are not only acquainted with local conditions but are also in close touch with other State and Federal forces in such an emergency and should be consulted. They will gladly cooperate.

Experience shows that much of the injury to agriculture caused by a severe drought is due to the fact that the dry weather was not anticipated and planned for and to the uncertainty of its duration. The crop losses are sometimes no greater than those caused by late spring and early fall frosts, and the period of feeding livestock without pasture usually is much shorter than that practiced each winter. In fact, in many agricultural regions of the United States drought of more or less severity is experienced every year.

Intelligent management of stock at such times can do much not only to avert losses but to make the livestock enterprise more efficient and profitable after the drought. Taking full advantage of rains when they come will aid much. Grains which are plentiful and rela-

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tively cheap can be substituted for those which suffered because of the dry weather. Straw, stover, and other roughages should be well stacked or stored to prevent the loss of feed nutrients caused by exposure to rain and sun.

Growing stock and pregnant animals should be kept on adequate rations with provision for normal growth. Loss of weight in other mature animals, however, need not be viewed with alarm. Livestock fluctuate in weight fully as much in proportion as human beings. It has been found to be sound management practice to permit cattle and sheep, for example, to draw rather heavily at times upon reserves of fat stored during seasons of abundant feed and pasture.

When marketings are forced by shortage of feed or water, advantage should be taken of the opportunity to cull inferior animals from flocks and herds. Foundation breeding stock should be the last to go.

Nothing can take the place of water. A shortage of feed can be much better withstood by livestock if an adequate supply of good water is convenient to them. During very hot weather, it will generally pay to haul the water to the stock rather than to drive them long distances or to expect them to find it.

Many regions in the United States experience periods of extremely dry weather during parts of nearly every growing season. Others suffer droughts irregularly every few years. The accumulated experience of stockmen who have weathered former droughts should be valuable in preventing unnecessary losses in recurring emergencies.

## EMERGENCY PASTURES

Pastures usually suffer more from drought than do other feed crops. While good pasture is the stockman's cheapest feed, it is not essential to livestock production and there are many ways of adequately supplementing and recovering from temporary pasture shortages.

Winter wheat, rye, and barley make excellent late fall and early spring pastures that aid greatly in conserving the winter's supply of concentrates and roughage.

For instance, a 10-year experiment at the United States Animal Husbandry Experiment Farm, Beltsville, Md., showed that an acre of fall-sown wheat or barley will furnish good grazing for 10 mature sheep for 27 days, and an acre of rye for 18 days. One advantage of rye, however, is that it is less likely to winterkill. Following is the results of 10 years' experiments with various temporary pastures for sheep on heavy clay land at Beltsville:

| Crop | Days grazing per acre for 10 mature ewes | Crop | Days grazing per acre for 10 mature ewes |
|---|---|---|---|
| Soybeans | 35 | Winter wheat | 27 |
| Oats and field peas | 35 | Winter barley | 27 |
| Corn and velvetbeans | 34 | Winter rye | 18 |

In the southern parts of the Corn Belt and the Cotton Belt locally adapted varieties of rye make much more pasturage than northern-grown rye. In the Gulf States winter oats may be preferable to rye as a pasture crop. Advice on this matter should be obtained from county extension agents or State experiment stations.

In many localities fall wheat or rye is grazed during favorable winter weather and in early spring and then allowed to mature a grain crop. If properly done this grazing aids rather than injures the crop for use as a harvested cereal.

Rape, which needs a rich soil, can be sown in early spring and furnishes excellent pasturage, particularly for sheep and hogs in midsummer when permanent pastures are short. This crop will not make a good start nor do well in hot, dry weather, however.

Temporary pastures which make luxuriant growth usually are wastefully trampled when pastured by livestock. Temporary fencing, used to divide a field into smaller sections, helps to reduce this loss by keeping the animals from roaming over the entire field.

Grazing on permanent pastures can be begun about two weeks earlier than usual in the spring as the result of a liberal application of a nitrogenous fertilizer a month or so before grazing begins.

## EMERGENCY HAY CROPS

Late fall or early spring crops of hay can often be grown to supplement pastures and winter supplies of concentrates, or to be fed with emergency root crops.

If rain comes by August 15 so that a seeding can be made on or before August 20, such crops as millet, Sudan grass, and cowpeas are reasonably safe risks for making hay before frost in the lower half of the Corn Belt and farther south. Or, they may be pastured, or cut and fed fresh from the field to animals in lots or barns, a practice known as soiling.

Rye and vetch in the southern part of the Corn Belt and rye, winter oats, and vetch in the Cotton Belt may be seeded in the fall and cut for hay late in the spring if the weather is promising for haymaking, or pastured if it is not. The use of vetch should not be attempted, however, unless local experience indicates that it can be grown successfully.

Oats and field peas sown together, besides making excellent spring pasture, make good hay practically equal in feeding value to alfalfa or clover hay, as well as highly satisfactory silage. They should be cut for the silo when the oats are in the late dough stage or the peas have hardened.

Often it will be found profitable to turn such crops as soybeans and cowpeas, which were intended for seed, into hay, if they have not approached too near maturity.

## SOILING CROPS

The practice of cutting forage crops and feeding them fresh to animals in confinement, a practice known as soiling, is an excellent means of getting maximum value out of green forage. It requires more labor but saves fencing and forage and provides large quantities of succulent feed from a given area. A Wisconsin experiment showed 1 acre of clover, corn, and oats used as soiling crops to be about equal to 2½ acres of good bluegrass pasture for dairy cows.

A great many crops are suitable for this purpose. Twenty-four acres of land, producing two and three crops during a season, yielded 278.3 tons of green forage, in a New Jersey experiment in a normal year, as shown in Table 1. The crops were used for feeding 50 dairy cows at the New Jersey station from May through October.

TABLE 1.—*Soiling crops grown at the New Jersey Agricultural Experiment Station for feeding a herd equal to 50 dairy cows for 6 months*

| Crops grown | Acres | Total seed used | Date of seeding | Period of cutting and feeding | Yield |
|---|---|---|---|---|---|
| | | *Bushels* | | | *Tons* |
| Rye | 2 | 4.0 | Sept. 27 | May 1–7 | 9.4 |
| Do | 2 | 4.0 | Oct. 3 | May 7–19 | 19.2 |
| Alfalfa, first cutting | 1 | .6 | May 14 | May 19–25[1] | 11.1 |
| Wheat | 2 | 4.0 | Sept. 26 | May 25–June 1 | 10.4 |
| Crimson clover | 6 | 1.2 | July 16 | June 1–21 | 42.8 |
| Mixed grasses | 1 | | | June 21–26 | 8.3 |
| Oats and peas | 2 | 4.0<br>3.0 | April 2 | June 26–July 4 | 12.4 |
| Do | 2 | 4.0<br>3.0 | April 11 | July 4–9 | 8.2 |
| Alfalfa, second cutting | | | | July 9–11 | 2.1 |
| Oats and peas | 5 | 10.0<br>7.5 | April 19 | July 11–22 | 16.4 |
| Southern white corn | 2 | .5 | May 2 | July 22–Aug. 3 | 17.7 |
| Barnyard millet | 2 | 1.4 | June 19 | Aug. 3–19 | 23.2 |
| Soybeans | 1 | 2.0 | June 1 | Aug. 19–25 | 8.8 |
| Cowpeas | 1 | 2.0 | June 10 | Aug. 25–Sept. 1 | 10.5 |
| Cowpeas and kafir | 2 | 2.0<br>1.0 | July 10 | Sept. 1–16 | 24.4 |
| Pearl millet | 2 | .25 | July 11 | Sept. 16–Oct. 1 | 20.2 |
| Cowpeas | 1 | 1.5 | July 24 | Oct. 1–5 | 8.0 |
| Mixed grasses (partly dried) | 5 | | | Oct. 5–27 | 20.0 |
| Barley | 2 | 3.5 | Sept. 2 | Oct. 27–Nov. 1 | 5.2 |
| Total | | | | | 278.3 |

[1] The following year.

An elaborate soiling rotation will not be found practicable on most farms. Many farmers, however, find it profitable to cut a portion of such crops as corn, alfalfa, or soybeans for use as soiling crops in emergencies and to harvest the remainder of the crop in the regular way.

## SILAGE

Silage is one of the most valuable feeds during a period of feed shortage caused by drought. It supplies the much-needed succulence for making possible the use of maximum quantities of dry roughages. Another advantage of silage is that many crops are more completely utilized as silage than in any other form.

Almost any green crop can be made into silage successfully. Good silage depends on harvesting at the right stage, fine cutting, and even distribution in the silo. Silage should be made of all the corn crop that will not mature because of dry weather or frost, and that has not become too dry. To make good silage the corn plant should contain not less than 60 per cent moisture. If it contains less, water must be added at the time of filling the silo. There is little danger of adding too much water. Since superficial examination is an unreliable guide to the moisture content of immature, drought-withered corn, the following precedure is advised:

Take a representative sample of at least 10 pounds from the field. Cut it into half-inch lengths. Weigh out exactly 10 pounds. Dry thoroughly, but without charring, in an oven. If the dried material weighs more than 4 pounds the corn may be considered too dry to place in the silo without the addition of water.

Since silage from immature corn is likely to be sour, a good practice is to mix such corn with some which is more mature.

When silage is made from hollow-stemmed plants such as the small cereal grains, fine cutting and firm packing are necessary to expel the air from the stems and thus prevent spoilage.

## EMERGENCY SILOS

Because of the great value of silage in drought emergencies farmers often construct temporary silos to supplement their permanent silos or to take their place if they have none. As a substitute for a silo, the use of slatted fence, such as that used to control the banking of snow along highways, has been found satisfactory by farmers. The fence is stood upright on the ground in a circle of sufficient diameter to give the "silo" a substantial base. When full another circle of fence is placed on the silage within the first. As many sections are added as needed. Farmers who have used this type of temporary silo have found it satisfactory, but have experienced considerable loss from spoilage on the sides. A roof is not necessary for the preservation of the silage, although some method of keeping out rain and snow makes the feeding easier. Wire netting on the top may be desirable to keep out birds.

Pit silos are used extensively in the Great Plains area. They should be constructed only in soils that are firm and free from rocks, sand strata, and seeps, and where the water table is always below the bottom of the floor after they are dug.

The trench silo is an adaptation of the pit silo which has proved highly satisfactory in many sections of the country. It is merely a long trench dug in the ground with a plow and slip scraper to a depth of 8 or 10 feet and a width and length depending on the number of livestock to be fed. For drainage purposes the bottom of the trench should be sloped. Location on a hillside simplifies the drainage problem. However, for convenience in feeding, the silo should be as near the barn as possible, and if a hillside is not available a drainage well bored into the subsoil with a well auger and fitted with a pipe with a strainer at the top will provide drainage if the pipe can extend into sand or gravel.

Trench silos have been in use for five years at the Coastal Plain Experiment Station at McNeill, Miss., under variable conditions of soil and drainage, with complete success. The soil there is Orangeburg sandy loam. Pasture clippings are thrown in the bottom of the silo to keep the silage clean. Sorghum silage is used and cut to a length of half an inch with an ordinary blower cutter. The silage is kept well tramped and well wetted while filling, especially along the side walls, which are nearly vertical. When filled, the silage is covered with 6 inches of pasture clippings and then 4 inches of soil. This soil is then made wet and a crawler tractor is run over it several times to compact the contents.

Feeding is begun at one end and a vertical slice is taken from top to bottom, opening up only enough for two or three days' feeding at a time.

Trench silos have several advantages. They can be made narrow, and therefore used for feeding a herd of but five or six cows. They are inexpensive to construct and can be used again year after year. Less machinery and much less power is required for filling than for aboveground silos where the silage must be elevated.

## STRAWS AND STOVERS

The straws and stovers produced annually in the United States have an aggregate animal-feeding value approximately equal to that of the hays and fodders, yet 96 per cent of the latter are uti-

lized for feeding and but 27 per cent of the former. Periods of feed shortage necessitate a better use of these feeds so often wasted.

Good oat straw, for example, is equal to corn stover and compares well with the poorer grades of clover hay for beef cattle and sheep. Yet there are about 35,000,000 tons of oat straw produced in the country annually and only 10,000,000 tons of it fed to stock.

Soybean straw, fed with shelled corn and linseed meal to sheep at the Ohio experiment station, was found to be worth one-third as much as good-quality clover or alfalfa hay. Sweetclover chaff, which is a by-product of the sweetclover-seed industry, reduced by 20 per cent the cost of wintering a band of ewe lambs at the United States Sheep Experiment Station, Dubois, Idaho, when fed at the rate of 2 pounds of chaff and 2½ pounds of alfalfa hay per head daily. The edible portion of nicely cured corn fodder compares well with timothy hay as a feed for dairy cows.

Two important rules should be observed in feeding straws, stovers, and other coarse, dry roughages to livestock: (1) A succulent, somewhat laxative feed such as pasture, soiling crops, silage, or root crops should be fed with them; and (2) careful stacking or storage under cover is necessary to prevent serious loss of palatability and food nutrients through exposure to sun and rain.

## ROOT CROPS

Though used extensively as feed for livestock in Europe and eastern Canada, root crops are not grown much for that purpose in the United States except in districts where summers are so cool or short that a satisfactory growth of corn for silage can not be obtained.

As an emergency feed, however, to furnish succulence in those areas which frequently experience droughts, root crops may have great value at times. Though low in dry matter and in crude protein, they are exceptionally high in digestibility and also in available energy for the dry matter they contain. The feeding of roots has found much favor among stockmen fitting animals for exhibition and among dairymen in some sections. Such roots as rutabagas and turnips, which are likely to taint milk, should be fed to dairy cows immediately after milking.

The New York (Cornell) Agricultural Experiment Station found root crops to yield approximately as shown in Table 2.

TABLE 2.—*Yield and dry matter per acre of various root crops obtained by the New York (Cornell) Agricultural Experiment Station at Ithaca, N. Y.*

| Crop | Green weight | Dry matter | Crop | Green weight | Dry matter |
|---|---|---|---|---|---|
| | *Tons* | *Tons* | | *Tons* | *Tons* |
| Mangels | 39.7 | 4.2 | Hybrid turnips | 27.1 | 2.6 |
| Sugar mangels | 28.1 | 3.2 | Turnips | 16.8 | 1.8 |
| Sugar beets | 28.3 | 4.0 | Carrots | 18.5 | 2.2 |
| Rutabagas (swedes) | 26.3 | 2.5 | Parsnips | 8.3 | 1.9 |

The relative yields of these crops will vary widely, however, depending on soil and climatic conditions.

## POTATOES

Only when potatoes have little value on the market and grain costs are high can their use as livestock feed be recommended. When corn is worth $1.40 a bushel, potatoes have a feeding value for hogs of about 30 cents a bushel.

For hogs, potatoes should be cooked before being fed. This adds to their cost but increases their feeding value about 60 per cent.

For horses, not more than 25 per cent of the grain may be replaced by chopped or sliced raw potatoes. It is safe to feed as high as 15 pounds a day to work horses. Potato sprouts are injurious to horses and should be removed.

For beef, cattle, sheep, and hogs potatoes may replace 50 per cent of the grain ration. Cattle may be fed at the rate of 25 to 30 pounds of cooked potatoes a day for each 1,000 pounds of live weight. In the rations of dairy cows potatoes, fed either raw or cooked, may replace silage, although they are inferior to it in palatability and in nutritive value. Mature sheep may be fed from 2 to 3 pounds a day. For hogs, potatoes should be supplemented with middlings and tankage or fish meal.

For poultry, the following laying mash is recommended as a means of utilizing potatoes:

| | Pounds |
|---|---|
| Meat scrap | 10 |
| Middlings | 10 |
| Bran | 20 |
| Cooked potatoes | 40 |

From 350 to 450 pounds of cooked potatoes are required to equal in feeding value 100 pounds of any of the standard cereal grains.

## WATER

The high temperatures which usually accompany a drought and the dryness of animal feeds at such times make ample supplies of water doubly important. More than half of the body weight of an animal consists of water. Seventy per cent of lean meat, 65 per cent of an egg and more than 85 per cent of milk is water.

If horses, cattle, and sheep can get a good drink once or preferably twice daily they will do well. Hogs and poultry should have it much oftener, close at hand if possible, where they can drink whenever they want it.

A horse needs from 10 to 12 gallons of water daily; a high-producing dairy cow as much as 25 to 40 gallons daily; a 2-year-old beef steer not less than 10 gallons; a hog one-half to 1½ gallons for each 100 pounds live weight; a sheep from 1 to 6 quarts daily depending on the feed received, the temperature, and the amount of dew or rain on its pasture; while a flock of 50 hens in laying condition will require from 4 to 6 quarts of water a day, supplied preferably in several containers. Water, in the foregoing quantities, will help materially to keep livestock in good condition, even though they are on limited feed.

## GRAIN SUBSTITUTES FOR CORN

Corn is the great American concentrate feed and more than twice as much of it is fed to livestock as all our other concentrate feeds combined. The corn fed to livestock in the United States each year

would support 22,000,000 adult cattle for one year. The corresponding figure for oats is 5,000,000; for wheat, 2,300,000; for barley, 2,000,000; for the grain sorghums, 700,000; and for cottonseed products, 470,000.

The corn crop, however, usually suffers more from severe drought than any other cereal crop, and the resulting higher price makes profitable the substitution of other grains for it in livestock feeding operations. Most of the small grains are but slightly inferior to corn for fattening, and some of them are superior to it as growing feeds.

A bushel of wheat, for example, is worth slightly more than a bushel of corn as livestock feed, since it weighs 4 pounds, or 7 per cent, more than a bushel of shelled corn, and since, based on digestible nutrients the two grains are practically equal, pound for pound.

Corn and corn products alone, make a better ration for most stock than wheat and wheat products alone, but no one harvested crop appears to possess all the varied nutrients essential for proper growth and fattening. A combination of grains, supplemented with high-protein feeds such as tankage, linseed or cottonseed meal, and legume hays, plus the maximum amount of good pasture, gives the best results.

Oats is an excellent growing feed. Barley, if free of scab and of good weigh, is an excellent fattening feed, especially favored by swine raisers in some sections. Wheat bran is one of the best conditioning feeds on the market.

All small hard grains such as wheat, barley, rye, milo, and kafir should be crushed or coarsely ground for livestock, and oats should be ground or rolled for young stock.

### WHEAT FOR BEEF CATTLE

For beef cattle wheat is somewhat less palatable than corn. They will eat it with relish, however, if it is crushed or ground and mixed with bran and cottonseed, linseed, or soybean meal, or other protein concentrate.

A Nebraska experiment showed wheat to be 5 per cent more efficient than corn for fattening steers when fed with alfalfa hay, a little prairie hay, straw, and linseed meal. The most satisfactory results were obtained in this experiment when 5 parts of wheat, 1 part of corn, and 1 part of linseed meal were fed with a mixture of alfalfa hay, prairie hay, and straw. Alfalfa hay formed about one-half of this roughage; prairie hay and wheat straw each a quarter. The steers consumed about one-half as much roughage as grain. The feeding test lasted 12 weeks and the steers averaged about 1,000 pounds when placed on feed.

SUGGESTED RATIONS FOR FATTENING STEERS

*For 600-pound steers*

| DRY RATIONS | | SUCCULENT RATIONS | |
|---|---|---|---|
| No. 1 | Pounds | No. 1 | Pounds |
| Wheat | 14 | Wheat | 10 |
| Protein meal | 1½ | Protein meal | 1½ |
| Mixed hay | 6 | Legume hay | 5 |
| | | Silage | 20 |
| No. 2 | | No. 2 | |
| Wheat | 12 | Wheat | 12 |
| Protein meal | 2½ | Protein meal | 2¼ |
| Cottonseed hulls | 10 | Sudan-grass hay | 4 |
| | | Silage | 15 |

*For 1,000-pound steers*

| DRY RATIONS | | SUCCULENT RATIONS | |
|---|---|---|---|
| No. 1 | Pounds | No. 1 | Pounds |
| Wheat | 16 | Wheat | 16 |
| Protein meal | 2½ | Protein meal | 2½ |
| Mixed hay | 10 | Mixed hay | 4½ |
| | | Silage | 17 |
| No. 2 | | No. 2 | |
| Wheat | 18 | Wheat | 15 |
| Protein meal | 2½ | Protein meal | 2½ |
| Straw | 5 | Straw or stover | 5 |
| Stover | 5 | Silage | 30 |

### WHEAT FOR DAIRY COWS

As for other classes of livestock, wheat should be rolled or ground for dairy cows, and then mixed with more bulky feeds such as ground oats or gluten feed. This is important because of the tendency of wheat when masticated to form a gummy mass not readily acted on by digestive juices. Here are three grain mixtures for dairy cows:

No. 1. Equal parts of wheat, oats, and barley. This contains about 12 per cent protein and is suitable for use with good pasture or with alfalfa, soybean, or Lespedeza hay.

No. 2. Equal parts of wheat, oats, and gluten feed. This contains 17 per cent protein and may be used with legume hay and silage or mixed hay alone.

No. 3. Equal parts of wheat, oats, gluten feed, and cottonseed meal. This contains 23 per cent protein and should be used with nonlegume hay and silage or either alone.

If they cost less, dried brewers' grains may be substituted for the gluten feed in any of the above mixtures.

A dairy feed containing 24 per cent protein can be reduced to 20 per cent protein by adding 100 pounds of ground wheat to 200 pounds of the dairy feed, thus making a mixture suitable for feeding with legume hay and silage or mixed hay alone.

A dairy feed containing 30 per cent protein can be reduced to a 24 per cent feed by adding 100 pounds of ground wheat to 200 pounds of the dairy feed. Such a ration will be suitable for use with a nonleguminous roughage.

### WHEAT FOR SWINE

For hogs wheat should be coarsely ground and fed in much the same way as corn. Though somewhat richer than corn in protein it should be supplemented with some protein of an animal origin such as skim milk, tankage, or fish meal.

Probably no better way can be found for feeding wheat to hogs than to feed it in a self-feeder, putting the ground wheat in one compartment, tankage or fish meal in another, and a simple mineral mixture in a third. Attention must be given the self-feeder to see that it does not become choked or that it does not feed too rapidly, as ground feed does not feed down so readily as whole grain.

Soaking either ground or whole wheat for hogs does not increase its feeding value enough to pay for the labor involved.

Sometimes shrunken wheat may be on hand or obtained at a reduced price, and if not too badly shrunken will prove equal to wheat of good quality as it contains even a higher percentage of protein than high-grade wheat.

### WHEAT FOR SHEEP

For sheep and fattening lambs wheat need not be ground. If possible it should be fed with good-quality, bright, legume hay. Durum or macaroni wheat has been found as good as common wheat for fattening lambs. A great deal of wheat screenings and frosted wheat is fed to lambs with satisfactory results by sheepmen.

A 3-year experiment in feeding lambs by the Utah experiment station showed that a ration of wheat screenings and alfalfa hay, with or without beet pulp, was more profitable than similar rations containing good wheat or frosted wheat in place of screenings.

The Montana station found that less wheat screenings and clover hay were required for each pound of gain on fattening lambs than when mixed grain, wheat, barley, or oats were substituted for the screenings.

### RATIONS FOR BREEDING EWES

Each of the following rations contains approximately the quantity of the various nutrients required daily for ewes of from 120 to 145 pounds in weight:

| RATION NO. 1 | Pounds |
|---|---|
| Alfalfa or cowpea hay | 2 |
| Corn silage | 2 |
| Wheat | ½ |

| RATION NO. 2 | Pounds |
|---|---|
| Oat straw | 1 |
| Corn silage | 2 |
| Linseed meal | ¼ |
| Wheat | ½ |

### WHEAT FOR HORSES AND MULES

For horses and mules wheat should be ground or rolled and fed in moderate quantities, preferably in combination with other feeds. If fed alone it may cause digestive disturbances. The most satisfactory results have been obtained when wheat was fed to horses with plenty of good-quality alfalfa hay. Wheat bran is a favorite feed among horsemen because it is especially palatable and safe. Being laxative, it is valuable for pregnant mares, idle work stock, and colts.

### DAILY RATIONS FOR 1,000-POUND HORSES AT MEDIUM WORK

| RATION NO. 1 | Pounds |
|---|---|
| Ear corn | 7 |
| Ground wheat | 5 |
| Alfalfa hay | 6 |
| Timothy hay | 7 |

| RATION NO. 2 | Pounds |
|---|---|
| Rolled barley | 5 |
| Rolled wheat | 5 |
| Alfalfa hay | 6 |
| Prairie hay | 5 |

### DAILY RATIONS FOR 1,000-POUND HORSES AT SEVERE WORK

| RATION NO. 3 | Pounds |
|---|---|
| Oats | 6 |
| Ground wheat | 6 |
| Wheat bran | 2 |
| Timothy hay | 8 |
| Clover hay | 5 |

| RATION NO. 4 | Pounds |
|---|---|
| Shelled corn | 7 |
| Ground wheat | 6 |
| Cottonseed meal | 1½ |
| Cowpea hay | 5 |
| Corn stover | 9 |

### WHEAT FOR POULTRY

For poultry wheat need not be ground, except for chicks until they are 8 or 10 weeks old. Although there is no grain considered quite the equal of yellow corn for poultry, wheat, wheat bran, and wheat middlings have long been popular poultry feeds in both scratch feeds and mashes.

FOR LAYING HENS

The following mash and scratch mixtures are recommended for laying hens when wheat is relatively cheap compared with other grains:

| LAYING MASH | Pounds |
|---|---|
| Wheat bran | 100 |
| Standard wheat middlings | 100 |
| Corn meal, yellow | 100 |
| Ground oats | 100 |
| Meat scrap | 100 |
| Dried buttermilk | 40 |
| Fine oyster shell | 35 |
| Common salt | 5 |

| LAYING SCRATCH MIXTURE | Pounds |
|---|---|
| Yellow corn | 200 |
| Wheat | 100 |
| or | |
| Yellow corn | 100 |
| Wheat | 100 |
| Cod-liver oil | 2 |

ALL-MASH MIXTURE FOR LAYING HENS

If an all-mash ration is preferred, the following is suggested:

| | Pounds | | Pounds |
|---|---|---|---|
| Ground wheat | 28 | Fish meal | 5½ |
| Yellow corn meal | 24 | Dried skim milk or buttermilk | 6 |
| Oat meal | 15 | Alfalfa meal | 2½ |
| Wheat bran or middlings | 9 | Fine oyster shell | 4 |
| Meat scrap | 5½ | Common salt | ½ |

One pound of cod-liver oil should be added to this mash if the hens are to be kept in confinement.

FOR CHICKS AND GROWING STOCK

| GROWING MASH | Pounds |
|---|---|
| Yellow corn meal | 20 |
| Ground wheat | 20 |
| Standard wheat middlings | 20 |
| Wheat bran | 20 |
| Meat scrap | 10 |
| Alfalfa leaf meal | 5 |
| Fine oyster shell | 3 |
| Cod-liver oil | 1½ |
| Salt | ½ |

GROWING SCRATCH MIXTURE

When chicks are 2 to 8 weeks old, equal parts of cracked wheat and cracked corn.

When chicks are 8 weeks old and more, equal parts of whole wheat and cracked corn.

The cod-liver oil in the above mash is desirable even though the chicks are on range with green feed available. If 40 pounds of yellow corn meal are used instead of the 20 pounds of yellow corn meal and 20 pounds of ground wheat, the addition of cod-liver oil is not necessary if the chicks are on green range.

WHEAT FATTENING FEEDS FOR POULTRY

| MIXTURE NO. 1 | Pounds |
|---|---|
| Ground wheat | 30 |
| Corn meal | 40 |
| Rolled oats | 30 |

| MIXTURE NO. 2 | Pounds |
|---|---|
| Ground wheat | 30 |
| Corn meal | 30 |
| Rolled oats | 30 |
| Wheat bran | 10 |

The above mixtures should be fed with skim milk or buttermilk in the proportion of 2 pounds of milk to 1 pound of mash. Skim milk or buttermilk are excellent feeds for fattening poultry, promoting growth, and improving the quality of the flesh.

## ECONOMY IN FEEDS

The greatest economy always is attained in feeding livestock when maximum quantities of home-grown feeds are used and when the ration is balanced to the animals' needs. The feeding of an ideal growing ration to fattening animals is wasteful of protein, one of the highest-priced ingredients in feeds. The feeding of a fattening ration to breeding animals jeopardizes their breeding ability and in the case of growing animals such a ration prevents proper development of substance and bone.

Overfeeding is wasteful in many ways. Animals overfed may eat more than they need or can digest properly, and often leave in their troughs feed which they will not eat later. Frequently they go "off feed" and have lost weight by the time they can be brought back to normal feeding. It is usually best to keep growing animals, at least, ready for a little more feed than they are receiving.

Underfeeding, likewise, is usually unprofitable and may cause serious loss. There is an exception, however, in the case of mature animals which are being wintered or carried through periods of feed shortage. Such animals may be allowed to lose a portion of their fat which has been stored during a season of abundant grass. Growing animals should be kept growing. At no other time can they make such efficient use of feed. Weight lost by them is more costly to replace than it was to produce originally. Bred females also should never be underfed. To do so may injure not only the offspring but also the animal itself and impair its future breeding value.

Most cases of underfeeding or overfeeding are the result of unbalanced rations. The wise feeder watches his stock and permits them to do much of the balancing of their own rations through selection. An animal will rarely overeat a feed rich in one feed nutrient if gradually accustomed to the feed and if feeds containing the other nutrients necessary to balance its body needs are available. If a feeder attempted to balance a ration for his shotes during any one week of their growing and fattening periods, the same ration would need to be changed in order to be balanced for their changed needs each following week. The natural selection which is guided by their own appetites forms the safest and the simplest guide.

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